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**Date:** 3/20/2018 9:47:40 AM  
**Subject:** Comment on Response to Comments hydro model  
**Attachments:** Appendix B.pdf

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Hi Piper, below is our input regarding the response to our comment related to water quality. As I understand, this issue is also a topic that the USFS and AECOM will be tracking and addressing.

Thank you for the responses to comments on the hydrologic model. The responses are helpful and provided clarifying information.

One of our comments #6 raises questions about water chemistry. The response identifies that this will be addressed in the SWWC. The response also states that "Short-term analysis related to peak or low streamflows is not the objective of the SWWC model. Rather, the model is designed to assess the general magnitude of potential system changes in response to long-term actions related to mining activities relative to current conditions."

The EIS should disclose impacts to water quality based on best case, base case, and reasonable worst case as well as the probability of the predicted outcomes, frequency, and phase of project/timeframe of impact. The effects will be compared to meeting water quality standards and for any permit decisions. Therefore, we need to understand magnitude, frequency, and duration. The SWWC only provides magnitude. We request continuous simulation modeling of the system to accomplish an effects analysis based also on frequency and duration. ID chronic aquatic life standards are pretty explicit about this.

The provision contained at IDAPA 58.01.02.210.03.d.i. states the following (highlighted for clarity):

**58.01.02.210.03.d. Application of toxics criteria.**

i. Frequency and duration for aquatic life toxics criteria. Column B1 criteria (**acute criteria**) are concentrations not to be exceeded for a one-hour average more than once in three (3) years. Column B2 criteria (**chronic criteria**) are concentrations not to be exceeded for a four-day average more than once in three (3) years.

The link to Idaho's WQS :

<https://adminrules.idaho.gov/rules/current/58/0102.pdf>

We recommend utilizing a similar approach to the Idaho Cobalt Project as presented in the final EIS. Attached is the Appendix B, *Surface Water and Groundwater Flows and Predicted Water Quality*, as an example of the method and format.

Thank you and Please let me know if you have any questions.

Lynne

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## **APPENDIX B**

### **SURFACE WATER AND GROUNDWATER FLOWS AND PREDICTED WATER QUALITY**

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**Table B-1a.**  
**Most Probable Case Predictions for Dissolved Copper Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

Jun-08

Alternative	Project Phase <sup>(1)</sup>	Bucktail Drainage <sup>(2)</sup>						Big Flat Creek Drainage <sup>(2)</sup>					
		Immediate Ram Mine Vicinity		Immediate Sunshine Mine Vicinity		Upper Bucktail Alluvium <sup>(3)</sup>		LAT Area		TWSF Area		Groundwater Quality Standard Met?	
		Copper Concentration mg/L	Groundwater Quality Standard Met?	Copper Concentration mg/L	Groundwater Quality Standard Met?	Copper Concentration mg/L	Groundwater Quality Standard Met?	Copper Concentration mg/L	Groundwater Quality Standard Met?	Copper Concentration mg/L	Groundwater Quality Standard Met?	Copper Concentration mg/L	Groundwater Quality Standard Met?
<b>Alt I - No Action</b>	Ram Operations (Pre BT-5)-Day 1521	0.036	Yes	0.016	Yes	7.50	No	0.033	Yes	0.003	Yes	0.003	Yes
	Ram Operations-Day 1887	0.036	Yes	0.016	Yes	1.50	No	0.033	Yes	0.003	Yes	0.003	Yes
	Sunshine Operations-Day 4809	0.036	Yes	0.016	Yes	1.50	No	0.033	Yes	0.003	Yes	0.003	Yes
	Closure (Year 5)-Day 6636	0.036	Yes	0.016	Yes	1.50	No	0.033	Yes	0.003	Yes	0.003	Yes
	Closure (Year 23)-Day 13210	0.036	Yes	0.016	Yes	1.50	No	0.033	Yes	0.003	Yes	0.003	Yes
<b>Alt II - FCC Proposal</b>	Ram Operations (Pre BT-5)-Day 1521	0.036	Yes	0.016	Yes	7.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Ram Operations-Day 1887	0.036	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Sunshine Operations-Day 4809	0.036	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Closure (Year 5)-Day 6636	0.090	Yes	2.652	No	1.84	No	Not Applicable	Not Applicable	0.0027	Yes	0.0027	Yes
	Closure (Year 23)-Day 13210	0.065	Yes	0.077	Yes	1.50	No	Not Applicable	Not Applicable	0.0029	Yes	0.0029	Yes
<b>Alt III - Perpetual Dewatering &amp; LAT</b>	Ram Operations (Pre BT-5)-Day 1521	0.036	Yes	0.016	Yes	7.50	No	0.033	Yes	0.003	Yes	0.003	Yes
	Ram Operations-Day 1887	0.036	Yes	0.016	Yes	1.50	No	0.033	Yes	0.003	Yes	0.003	Yes
	Sunshine Operations-Day 4809	0.036	Yes	0.016	Yes	1.50	No	0.033	Yes	0.003	Yes	0.003	Yes
	Closure (Year 5)-Day 6636	0.036	Yes	0.037	No	1.54	No	0.033	Yes	0.003	Yes	0.003	Yes
	Closure (Year 23)-Day 13210	0.036	Yes	0.044	Yes	1.50	No	0.033	Yes	0.003	Yes	0.003	Yes
<b>Alt IV - Comprehensive GW Capture &amp; NPDES Big Deer Creek</b>	Ram Operations (Pre BT-5)-Day 1521	0.036	Yes	0.016	Yes	7.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Ram Operations-Day 1887	0.036	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Sunshine Operations-Day 4809	0.036	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	0.0026	Yes	0.0026	Yes
	Closure (Year 5)-Day 6636	0.043	Yes	0.337	Yes	1.54	No	Not Applicable	Not Applicable	0.0028	Yes	0.0028	Yes
	Closure (Year 23)-Day 13210	0.044	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
<b>Alt V - Comprehensive GW Capture &amp; NPDES Blackbird Creek</b>	Ram Operations (Pre BT-5)-Day 1521	0.036	Yes	0.016	Yes	7.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Ram Operations-Day 1887	0.036	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Sunshine Operations-Day 4809	0.036	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	0.003	Yes	0.003	Yes
	Closure (Year 5)-Day 6636	0.043	Yes	0.337	Yes	1.54	No	Not Applicable	Not Applicable	0.0026	Yes	0.0026	Yes
	Closure (Year 23)-Day 13210	0.044	Yes	0.016	Yes	1.50	No	Not Applicable	Not Applicable	0.0028	Yes	0.0028	Yes

#### Relative Impacts from IC-P-Derived Dissolved Copper

green = decrease, no change, or negligible increase that is nonmeasurable (NM)  
yellow = concentration increase; does not contribute to WQ standards exceedance  
orange = substantial increase and/or contributes to WQ standard exceedance

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.

(2) Immediate Ram Mine Vicinity refers to bedrock groundwater between Ram workings and Bucktail Ck; Immediate Sunshine Mine Vicinity refers to bedrock groundwater between Sunshine workings and East and West Forks Bucktail Ck; Upper Bucktail Alluvium refers to BMSG Phase II capture system vicinity; TWSF Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.

(3) Alt 2 Upper Bucktail Alluvium concentrations represent effects of BMSG Phase II capture system and 75% capture of Sunshine Mine load by IC-P bedrock groundwater capture wells.  
Pre-BT-5 (day 1521) represents conditions prior to onset of BT-5 diversion and other related BMSG cleanup efforts in Bucktail drainage. Decreases in Day 1521 to 1887 concentration in Upper Bucktail Alluvium based on assumed 80% reduction from BMSG Phase II capture system.

Concentrations below detection limit replaced with detection limit for calculating background (No Action concentrations).  
Idaho Groundwater Quality Standard for Copper=1.30 mg/L.

**Table B-1b.**  
**Most Probable Case Predictions for Sulfate Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

		Bucktail Drainage <sup>(2)</sup>				Big Flat Creek Drainage <sup>(2)</sup>				TWSF Area	
		Immediate Ram Mine Vicinity		Upper Bucktail Alluvium <sup>(3)</sup>		LAT Area		Groundwater Quality Standard Met?		Groundwater Quality Standard Met?	
Alternative	Project Phase <sup>(1)</sup>	Sulfate Concentration mg/L	Groundwater Quality Standard Met?	Sulfate Concentration mg/L	Groundwater Quality Standard Met?	Sulfate Concentration mg/L	Groundwater Quality Standard Met?	Mean Sulfate Concentration mg/L	Sulfate Concentration mg/L	Groundwater Quality Standard Met?	Groundwater Quality Standard Met?
<b>Alt I - No Action</b>	Ram Operations (Pre BT-5)-Day 1521	27	Yes	27	Yes	200	Yes	1.5	Yes	1.0	Yes
	Ram Operations-Day 1887	27	Yes	27	Yes	40	Yes	1.5	Yes	1.0	Yes
	Sunshine Operations-Day 4809	27	Yes	27	Yes	40	Yes	1.5	Yes	1.0	Yes
	Closure (Year 5)-Day 6636	27	Yes	27	Yes	40	Yes	1.5	Yes	1.0	Yes
	Closure (Year 23)-Day 13210	27	Yes	27	Yes	40	Yes	1.5	Yes	1.0	Yes
<b>Alt II - FCC Proposal</b>	Ram Operations (Pre BT-5)-Day 1521	27	Yes	27	Yes	200	Yes	Not Applicable	1.0	Yes	Yes
	Ram Operations-Day 1887	27	Yes	27	Yes	40	Yes	Not Applicable	1.0	Yes	Yes
	Sunshine Operations-Day 4809	27	Yes	27	Yes	40	Yes	Not Applicable	1.0	Yes	Yes
	Closure (Year 5)-Day 6636	298	No	126	No	56	Yes	Not Applicable	123	Yes	Yes
	Closure (Year 23)-Day 13210	51	Yes	25	Yes	43	Yes	Not Applicable	92	Yes	Yes
<b>Alt III - Perpetual Dewatering &amp; LAT</b>	Ram Operations (Pre BT-5)-Day 1521	27	Yes	27	Yes	200	Yes	283	No	1.0	Yes
	Ram Operations-Day 1887	27	Yes	27	Yes	40	Yes	237	Yes	1.0	Yes
	Sunshine Operations-Day 4809	27	Yes	27	Yes	40	Yes	76	Yes	1.0	Yes
	Closure (Year 5)-Day 6636	27	Yes	27	Yes	39.5	Yes	76	Yes	169	Yes
	Closure (Year 23)-Day 13210	27	Yes	27	Yes	39.5	Yes	76	Yes	52	Yes
<b>Alt IV - Comprehensive GW Capture &amp; NPDES Big Deer Creek</b>	Ram Operations (Pre BT-5)-Day 1521	27	Yes	27	Yes	200	Yes	Not Applicable	1.0	Yes	Yes
	Ram Operations-Day 1887	27	Yes	27	Yes	40	Yes	Not Applicable	1.0	Yes	Yes
	Sunshine Operations-Day 4809	27	Yes	27	Yes	40	Yes	Not Applicable	1.0	Yes	Yes
	Closure (Year 5)-Day 6636	298	No	126	No	56	Yes	Not Applicable	169	Yes	Yes
	Closure (Year 23)-Day 13210	52	Yes	25	Yes	43	Yes	Not Applicable	52	Yes	Yes
<b>Alt V - Comprehensive GW Capture &amp; NPDES Blackbird Creek</b>	Ram Operations (Pre BT-5)-Day 1521	27	Yes	27	Yes	200	Yes	Not Applicable	1.0	Yes	Yes
	Ram Operations-Day 1887	27	Yes	27	Yes	40	Yes	Not Applicable	1.0	Yes	Yes
	Sunshine Operations-Day 4809	27	Yes	27	Yes	40	Yes	Not Applicable	1.0	Yes	Yes
	Closure (Year 5)-Day 6636	298	No	126	No	56	Yes	Not Applicable	169	Yes	Yes
	Closure (Year 23)-Day 13210	52	Yes	25	Yes	43	Yes	Not Applicable	52	Yes	Yes

**Relative Impacts from ICP-Derived Sulfate**

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.

(2) Immediate Ram Mine Vicinity refers to bedrock groundwater between Sunshine workings and East and West Forks Bucktail Ck; Upper Bucktail Alluvium refers to BMSG Phase II capture system vicinity; TWSF Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.

(3) Alt 2 Upper Bucktail Alluvium concentrations represent effects of BMSG Phase II capture system and 75% capture of Sunshine Mine load by ICP bedrock groundwater capture wells. Water quality exceedances based on Idaho secondary constituent standard of 250 mg/L for sulfate.

green = decrease, no change, or negligible increase that is nonmeasurable (NM)  
yellow = concentration increase; does not contribute to WQ standards exceedance  
orange = substantial increase and/or contributes to WQ standard exceedance

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.  
(2) Immediate Sunshine Mine Vicinity refers to bedrock groundwater between Sunshine workings and East and West Forks Bucktail Ck; Upper Bucktail Alluvium refers to BMSG Phase II capture system vicinity; TWSF Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.

(3) Alt 2 Upper Bucktail Alluvium concentrations represent effects of BMSG Phase II capture system and 75% capture of Sunshine Mine load by ICP bedrock groundwater capture wells. Water quality exceedances based on Idaho secondary constituent standard of 250 mg/L for sulfate.

**Table B-1c.**  
**Most Probable Case Predictions for Dissolved Arsenic Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

Alternative	Project Phase <sup>(1)</sup>	Bucktail Drainage <sup>(3)</sup>						Big Flat Creek Drainage <sup>(3)</sup>					
		Immediate Ram Mine Vicinity Groundwater Arsenic Concentration mg/L	Arsenic Quality Standard Met?	Immediate Sunshine Mine Vicinity Groundwater Arsenic Concentration mg/L	Arsenic Quality Standard Met?	Upper Bucktail Alluvium Groundwater Arsenic Concentration mg/L	Arsenic Quality Standard Met?	LAT Area Groundwater Arsenic Concentration mg/L	Arsenic Quality Standard Met?	TWSF Area Groundwater Arsenic Concentration mg/L	Arsenic Quality Standard Met?		
Alt I - No Action													
Ram Operations (Pre BT-5)-Day 1521	0.0038	Yes	No	0.069	No	0.002	Yes	0.001	Yes	0.0009	Yes	Yes	
Ram Operations-Day 1887	0.0038	Yes	No	0.069	No	0.0004	Yes	0.001	Yes	0.0009	Yes	Yes	
Sunshine Operations-Day 4809	0.0038	Yes	No	0.069	No	0.0004	Yes	0.001	Yes	0.0009	Yes	Yes	
Closure (Year 5)-Day 6366	0.0038	Yes	No	0.069	No	0.0004	Yes	0.001	Yes	0.0009	Yes	Yes	
Closure (Year 23)-Day 13210	0.0038	Yes	No	0.069	No	0.0004	Yes	0.001	Yes	0.0009	Yes	Yes	
Alt II - FCC Proposal													
Ram Operations (Pre BT-5)-Day 1521	0.0038	Yes	No	0.069	No	0.002	Yes			0.0009	Yes		
Ram Operations-Day 1887	0.0038	Yes	No	0.069	No	0.0004	Yes			0.0009	Yes		
Sunshine Operations-Day 4809	0.0038	Yes	No	0.069	No	0.0004	Yes			0.0009	Yes		
Closure (Year 5)-Day 6366	(2)		(2)		(2)		(2)			0.0011			
Closure (Year 23)-Day 13210	(2)		(2)		(2)		(2)			0.0010			
Alt III - Perpetual Dewatering & LAT													
Ram Operations (Pre BT-5)-Day 1521	0.0038	Yes	No	0.069	No	0.002	Yes	<0.0015	Yes	0.0009	Yes		
Ram Operations-Day 1887	0.0038	Yes	No	0.069	No	0.0004	Yes	<0.0015	Yes	0.0009	Yes		
Sunshine Operations-Day 4809	0.0038	Yes	No	0.069	No	0.0004	Yes	<0.0015	Yes	0.0009	Yes		
Closure (Year 5)-Day 6366	0.0038	Yes	No	0.069	No	0.0004	Yes	<0.0015	Yes	0.0009	Yes		
Closure (Year 23)-Day 13210	0.0038	Yes	No	0.069	No	0.0004	Yes	<0.0015	Yes	0.0009	Yes		
Alt IV - Comprehensive GW Capture & NPDES Big Deer Creek													
Ram Operations (Pre BT-5)-Day 1521	0.0038	Yes	No	0.069	No	0.002	Yes			0.0009	Yes		
Ram Operations-Day 1887	0.0038	Yes	No	0.069	No	0.0004	Yes			0.0009	Yes		
Sunshine Operations-Day 4809	0.0038	Yes	No	0.069	No	0.0004	Yes			0.0009	Yes		
Closure (Year 5)-Day 6366	(2)		(2)		(2)		(2)			0.0012			
Closure (Year 23)-Day 13210	(2)		(2)		(2)		(2)			0.0010			
Alt V - Comprehensive GW Capture & NPDES Blackbird Creek													
Ram Operations (Pre BT-5)-Day 1521	0.0038	Yes	No	0.069	No	0.002	Yes			0.0009	Yes		
Ram Operations-Day 1887	0.0038	Yes	No	0.069	No	0.0004	Yes			0.0009	Yes		
Sunshine Operations-Day 4809	0.0038	Yes	No	0.069	No	0.0004	Yes			0.0009	Yes		
Closure (Year 5)-Day 6366	(2)		(2)		(2)		(2)			0.0012			
Closure (Year 23)-Day 13210	(2)		(2)		(2)		(2)			0.0010			

#### Relative Impacts from ICP-Derived Dissolved Arsenic

green = decrease, no change, or negligible increase that is nonmeasurable (NM)  
yellow = concentration increase; does not contribute to WQ standards exceedance  
orange = substantial increase and/or contributes to WQ standard exceedance

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.

(2) Arsenic concentrations for groundwater not available from Dynamic Systems Model. DSM results indicate mine water concentrations may exceed 100 parts per billion; however groundwater concentrations are expected to be significantly lower (below drinking water standard of 50 parts per billion) due to chemical attenuation.

(3) Immediate Ram Mine Vicinity refers to bedrock groundwater between Ram workings and Bucktail Alluvium between Sunshine Mine Vicinity and Bucktail Alluvium. LAT Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.

Pre-BT-5 (day 1521) represents conditions prior to onset of BT-5 diversion and other related BMSG cleanup efforts in Bucktail drainage. Decreases in Day 1521 to 1887 concentration in Upper Bucktail Alluvium based on assumed 80% reduction from BMSG Phase II capture system.

Concentrations below detection limit replaced with detection limit for calculating background (No Action concentrations).

**Table B-1d.**  
**Most Probable Case Predictions for Dissolved Cobalt Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

		Bucktail Drainage <sup>(2)</sup>						Big Flat Creek Drainage <sup>(2)</sup>								
		Immediate Ram Mine Vicinity			Upper Bucktail Alluvium <sup>(3)</sup>			LAT Area			Cobalt Concentration mg/L			Groundwater Quality Exceedance?		
Alternative	Project Phase <sup>(1)</sup>	Cobalt Concentration mg/L	Groundwater Quality Exceedance?	Cobalt Concentration mg/L	Groundwater Quality Exceedance?	Cobalt Concentration mg/L	Groundwater Quality Exceedance?	Cobalt Concentration mg/L	Groundwater Quality Exceedance?	Cobalt Concentration mg/L	Groundwater Quality Exceedance?	Cobalt Concentration mg/L	Groundwater Quality Exceedance?	Cobalt Concentration mg/L	Groundwater Quality Exceedance?	
<b>Alt I - No Action</b>																
Ram Operations (Pre BT-5)-Day 1521	0.055	NA	0.19	NA	0.19	NA	0.350	NA	0.009	NA	0.0016	NA	0.0016	NA	0.0016	
Ram Operations-Day 1887	0.055	NA	0.19	NA	0.19	NA	0.70	NA	0.009	NA	0.0016	NA	0.0016	NA	0.0016	
Sunshine Operations-Day 4809	0.055	NA	0.19	NA	0.19	NA	0.70	NA	0.009	NA	0.0016	NA	0.0016	NA	0.0016	
Closure (Year 5)-Day 6636	0.055	NA	0.19	NA	0.19	NA	0.70	NA	0.009	NA	0.0016	NA	0.0016	NA	0.0016	
Closure (Year 23)-Day 13210	0.055	NA	0.19	NA	0.19	NA	0.70	NA	0.009	NA	0.0016	NA	0.0016	NA	0.0016	
<b>Alt II - FCC Proposal</b>																
Ram Operations (Pre BT-5)-Day 1521	0.055	NA	0.19	NA	0.19	NA	3.50	NA	Not Applicable	0.0016	NA	0.0016	NA	0.0016	NA	
Ram Operations-Day 1887	0.055	NA	0.19	NA	0.19	NA	0.70	NA	Not Applicable	0.0016	NA	0.0016	NA	0.0016	NA	
Sunshine Operations-Day 4809	0.055	NA	0.19	NA	0.19	NA	0.70	NA	Not Applicable	0.0016	NA	0.0016	NA	0.0016	NA	
Closure (Year 5)-Day 6636	0.126	NA	6.445	NA	1.55	NA	0.74	NA	Not Applicable	0.00241	NA	0.0026	NA	0.0026	NA	
Closure (Year 23)-Day 13210	0.081	NA	0.330	NA	0.74	NA	0.74	NA	Not Applicable	0.0026	NA	0.0026	NA	0.0026	NA	
<b>Alt III - Perpetual Dewatering &amp; LAT</b>																
Ram Operations (Pre BT-5)-Day 1521	0.055	NA	0.19	NA	0.19	NA	3.50	NA	<0.03	NA	0.0016	NA	0.0016	NA	0.0016	
Ram Operations-Day 1887	0.055	NA	0.19	NA	0.19	NA	0.70	NA	<0.03	NA	0.0016	NA	0.0016	NA	0.0016	
Sunshine Operations-Day 4809	0.055	NA	0.19	NA	0.19	NA	0.70	NA	<0.03	NA	0.0016	NA	0.0016	NA	0.0016	
Closure (Year 5)-Day 6636	0.055	NA	0.19	NA	0.19	NA	0.70	NA	<0.03	NA	0.0016	NA	0.0016	NA	0.0016	
Closure (Year 23)-Day 13210	0.055	NA	0.19	NA	0.19	NA	0.70	NA	<0.03	NA	0.0016	NA	0.0016	NA	0.0016	
<b>Alt IV - Comprehensive GW Capture &amp; NPDES Big Deer Creek</b>																
Ram Operations (Pre BT-5)-Day 1521	0.055	NA	0.19	NA	0.19	NA	3.50	NA	Not Applicable	0.0016	NA	0.0016	NA	0.0016	NA	
Ram Operations-Day 1887	0.055	NA	0.19	NA	0.19	NA	0.70	NA	Not Applicable	0.0016	NA	0.0016	NA	0.0016	NA	
Sunshine Operations-Day 4809	0.055	NA	0.19	NA	0.955	NA	0.70	NA	Not Applicable	0.0016	NA	0.0058	NA	0.0034	NA	
Closure (Year 5)-Day 6636	0.042	NA	0.186	NA	0.186	NA	0.82	NA	Not Applicable	0.0016	NA	0.0034	NA	0.0034	NA	
Closure (Year 23)-Day 13210	0.042	NA	0.186	NA	0.186	NA	0.72	NA	Not Applicable	0.0016	NA	0.0034	NA	0.0034	NA	
<b>Alt V - Comprehensive GW Capture &amp; NPDES Blackbird Creek</b>																
Ram Operations (Pre BT-5)-Day 1521	0.055	NA	0.19	NA	0.19	NA	3.50	NA	Not Applicable	0.0016	NA	0.0016	NA	0.0016	NA	
Ram Operations-Day 1887	0.055	NA	0.19	NA	0.19	NA	0.70	NA	Not Applicable	0.0016	NA	0.0016	NA	0.0016	NA	
Sunshine Operations-Day 4809	0.055	NA	0.19	NA	0.955	NA	0.70	NA	Not Applicable	0.0016	NA	0.0058	NA	0.0058	NA	
Closure (Year 5)-Day 6636	0.042	NA	0.186	NA	0.186	NA	0.82	NA	Not Applicable	0.0016	NA	0.0034	NA	0.0034	NA	
Closure (Year 23)-Day 13210	0.042	NA	0.186	NA	0.186	NA	0.72	NA	Not Applicable	0.0016	NA	0.0034	NA	0.0034	NA	

#### Relative Impacts from ICP-Derived Dissolved Cobalt

green = decrease, no change, or negligible increase that is nonmeasurable (NM)  
yellow = concentration increase; does not contribute to WQ standards exceedance  
orange = substantial increase and/or contributes to WQ standard exceedance

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.

(2) Immediate Ram Mine Vicinity refers to bedrock groundwater between Ram workings and Bucktail Ck; Sunshine Mine Vicinity refers to bedrock groundwater between Sunshine workings and East and West Forks Bucktail Ck; Upper Bucktail Alluvium refers to BMSG Phase II capture system vicinity; TWSF Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.

(3) Alt 2 Upper Bucktail Alluvium concentrations represent effects of BMSG Phase II capture system and 75% capture of Sunshine Mine load by ICP bedrock groundwater capture wells. Reduction from BMSG Phase II capture system.

Concentrations below detection limit replaced with detection limit for calculating background (No Action concentrations). No Idaho Groundwater Quality Standard exists for Cobalt.

Jun-08  
**Table B-1e.**  
**Most Probable Case Predictions for Dissolved Nickel Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

Alternative	Project Phase <sup>(1)</sup>	Bucktail Drainage <sup>(2)</sup>				Big Flat Creek Drainage <sup>(2)</sup>			
		Nickel Concentration mg/L	Groundwater Quality Standard Met?	Nickel Concentration mg/L	Groundwater Quality Standard Met?	Nickel Concentration mg/L	Groundwater Quality Standard Met?	Nickel Concentration mg/L	Groundwater Quality Standard Met?
<b>Alt I - No Action</b>									
Ram Operations (Pre BT-5)-Day 1521	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Ram Operations-Day 1887	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Sunshine Operations-Day 4809	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Closure (Year 5)-Day 6636	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Closure (Year 23)-Day 13210	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
<b>Alt II - FCC Proposal</b>									
Ram Operations (Pre BT-5)-Day 1521	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Ram Operations-Day 1887	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Sunshine Operations-Day 4809	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Closure (Year 5)-Day 6636	0.0080	NA	0.293	NA	Not Applicable	NA	0.0001	NA	NA
Closure (Year 23)-Day 13210	0.0050	NA	0.010	NA	Not Applicable	NA	0.0000	NA	NA
<b>Alt III - Perpetual Dewatering &amp; LAT</b>									
Ram Operations (Pre BT-5)-Day 1521	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Ram Operations-Day 1887	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Sunshine Operations-Day 4809	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Closure (Year 5)-Day 6636	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
Closure (Year 23)-Day 13210	0.0025	NA	0.005	NA	0.0014	NA	0.0014	NA	NA
<b>Alt IV - Comprehensive GW Capture &amp; NPDES Big Deer Creek</b>									
Ram Operations (Pre BT-5)-Day 1521	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Ram Operations-Day 1887	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Sunshine Operations-Day 4809	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Closure (Year 5)-Day 6636	0.0020	NA	0.040	NA	Not Applicable	NA	0.0001	NA	NA
Closure (Year 23)-Day 13210	0.0020	NA	0.003	NA	Not Applicable	NA	0.0001	NA	NA
<b>Alt V - Comprehensive GW Capture &amp; NPDES Blackbird Creek</b>									
Ram Operations (Pre BT-5)-Day 1521	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Ram Operations-Day 1887	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Sunshine Operations-Day 4809	0.0025	NA	0.005	NA	Not Applicable	NA	0.0000	NA	NA
Closure (Year 5)-Day 6636	0.0020	NA	0.040	NA	Not Applicable	NA	0.0001	NA	NA
Closure (Year 23)-Day 13210	0.0020	NA	0.003	NA	Not Applicable	NA	0.0001	NA	NA

**Relative Impacts from ICP-Derived Dissolved Nickel**

green = decrease, no change, or negligible increase that is nonmeasurable (NM)

yellow = concentration increase; does not contribute to WQ standards exceedance

orange = substantial increase and/or contributes to WQ standard exceedance

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.

(2) Immediate Ram Mine Vicinity refers to bedrock groundwater between Ram workings and Bucktail Ck; Immediate Sunshine Mine Vicinity refers to shallow and bedrock groundwater between Sunshine workings and East and West Forks Bucktail Ck; TWSF Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.

Pre-BT-5 (day 1521) represents conditions prior to onset of BT-5 diversion and other related BMSG cleanup efforts in Bucktail drainage.

Concentrations below detection limit replaced with detection limit for calculating background (No Action concentrations).  
 No Idaho Groundwater Quality Standard exists for Nickel.

**Table B-1f.**  
**Most Probable Case Predictions for Dissolved Zinc Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

Alternative	Project Phase <sup>(1)</sup>	Bucktail Drainage <sup>(2)</sup>						Big Flat Creek Drainage <sup>(2)</sup>					
		Immediate Ram Mine Vicinity		Sunshine Mine Vicinity		LAT Area		TWSF Area		Groundwater		Groundwater	
		Zinc Concentration mg/L	Zinc Groundwater Quality Standard Met?	Zinc Concentration mg/L	Zinc Groundwater Quality Standard Met?	Zinc Concentration mg/L	Zinc Groundwater Quality Standard Met?	Zinc Concentration mg/L	Zinc Groundwater Quality Standard Met?	Zinc Concentration mg/L	Zinc Groundwater Quality Standard Met?	Zinc Concentration mg/L	Zinc Groundwater Quality Standard Met?
<b>Alt I - No Action</b>	Ram Operations (Pre BT-5)-Day 1521	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Ram Operations-Day 1887	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Sunshine Operations-Day 4809	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Closure (Year 5)-Day 6636	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Closure (Year 23)-Day 13210	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
<b>Alt II - FCC Proposal</b>	Ram Operations (Pre BT-5)-Day 1521	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0000	Yes	0.0000	Yes
	Ram Operations-Day 1887	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0000	Yes	0.0000	Yes
	Sunshine Operations-Day 4809	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0003	Yes	0.0003	Yes
	Closure (Year 5)-Day 6636	0.049	Yes	0.349	Yes	Not Applicable	Not Applicable	0.0001	Yes	Not Applicable	Not Applicable	0.0001	Yes
	Closure (Year 23)-Day 13210	0.045	Yes	0.026	Yes	Not Applicable	Not Applicable	0.0001	Yes	Not Applicable	Not Applicable	0.0001	Yes
<b>Alt III - Perpetual Dewatering &amp; LAT</b>	Ram Operations (Pre BT-5)-Day 1521	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Ram Operations-Day 1887	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Sunshine Operations-Day 4809	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Closure (Year 5)-Day 6636	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
	Closure (Year 23)-Day 13210	0.024	Yes	0.023	Yes	0.015	Yes	0.019	Yes	0.019	Yes	0.019	Yes
<b>Alt IV - Comprehensive GW Capture &amp; NPD&amp;ES Big Deer Creek</b>	Ram Operations (Pre BT-5)-Day 1521	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0000	Yes	0.0000	Yes
	Ram Operations-Day 1887	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0000	Yes	0.0000	Yes
	Sunshine Operations-Day 4809	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.00053	Yes	0.00053	Yes	0.00053	Yes
	Closure (Year 5)-Day 6636	0.040	Yes	0.098	Yes	Not Applicable	Not Applicable	0.00018	Yes	Not Applicable	Not Applicable	0.00018	Yes
	Closure (Year 23)-Day 13210	0.040	Yes	0.016	Yes	Not Applicable	Not Applicable	0.00018	Yes	Not Applicable	Not Applicable	0.00018	Yes
<b>Alt V - Comprehensive GW Capture &amp; NPDES Blackbird Creek</b>	Ram Operations (Pre BT-5)-Day 1521	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0000	Yes	0.0000	Yes
	Ram Operations-Day 1887	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0000	Yes	0.0000	Yes
	Sunshine Operations-Day 4809	0.024	Yes	0.023	Yes	Not Applicable	Not Applicable	0.0000	Yes	0.0000	Yes	0.0000	Yes
	Closure (Year 5)-Day 6636	0.040	Yes	0.098	Yes	Not Applicable	Not Applicable	0.00053	Yes	0.00053	Yes	0.00053	Yes
	Closure (Year 23)-Day 13210	0.040	Yes	0.016	Yes	Not Applicable	Not Applicable	0.00018	Yes	Not Applicable	Not Applicable	0.00018	Yes

#### Relative Impacts from ICP-Derived Dissolved Zinc

green = decrease, no change, or negligible increase that is nonmeasurable (NM)

yellow = concentration increase; does not contribute to WQ standards exceedance

orange = substantial increase and/or contributes to WQ standard exceedance

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.

(2) Immediate Ram Mine Vicinity refers to bedrock groundwater between Ram workings and Bucktail Ck; Sunshine Mine Vicinity refers to bedrock groundwater between Sunshine workings and East and West Forks Bucktail Ck; LAT Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.

Pre-BT-5 (day 1521) represents conditions prior to onset of BT-5 diversion and other related BMSG cleanup efforts in Bucktail drainage.

Concentrations below detection limit replaced with detection limit for calculating background (No Action concentrations). Water quality exceedances based on Idaho secondary constituent standard of 5.0 mg/L for zinc.

Table B-1g.

**Most Probable Case Predictions for Dissolved Nitrate Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

Alternative	Project Phase <sup>(1)</sup>	Bucktail Drainage <sup>(2)</sup>				Big Flat Creek Drainage <sup>(2)</sup>			
		Immediate Ram Mine Vicinity	Nitrate Concentration mg/L	Groundwater Quality Standard Met?	Groundwater Quality Standard Met?	Immediate Sunshine Mine Vicinity	Nitrate Concentration mg/L	Groundwater Quality Standard Met?	Groundwater Quality Standard Met?
<b>Alt I - No Action</b>									
Ram Operations (Pre BT-5)-Day 1521	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	0.30
Ram Operations-Day 1887	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	0.30
Sunshine Operations-Day 4809	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	0.30
Closure (Year 5)-Day 6636	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	0.30
Closure (Year 23)-Day 13210	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	0.30
<b>Alt II - FCCC Proposal</b>									
Ram Operations (Pre BT-5)-Day 1521	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Ram Operations-Day 1887	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Sunshine Operations-Day 4809	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Closure (Year 5)-Day 6636	3.20	Yes	3.70	Yes	3.70	Yes	Not Applicable	NA	NA
Closure (Year 23)-Day 13210	0.40	Yes	0.54	Yes	0.54	Yes	Not Applicable	NA	NA
<b>Alt III - Perpetual Dewatering &amp; LAT</b>									
Ram Operations (Pre BT-5)-Day 1521	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	NA
Ram Operations-Day 1887	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	NA
Sunshine Operations-Day 4809	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	NA
Closure (Year 5)-Day 6636	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	NA
Closure (Year 23)-Day 13210	0.50	Yes	0.55	Yes	0.55	Yes	0.30	Yes	NA
<b>Alt IV - Comprehensive GW Capture &amp; NPDES Big Deer Creek</b>									
Ram Operations (Pre BT-5)-Day 1521	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Ram Operations-Day 1887	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Sunshine Operations-Day 4809	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Closure (Year 5)-Day 6636	3.20	Yes	3.70	Yes	3.70	Yes	Not Applicable	NA	NA
Closure (Year 23)-Day 13210	0.40	Yes	0.54	Yes	0.54	Yes	Not Applicable	NA	NA
<b>Alt V - Comprehensive GW Capture &amp; NPDES Blackbird Creek</b>									
Ram Operations (Pre BT-5)-Day 1521	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Ram Operations-Day 1887	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Sunshine Operations-Day 4809	0.50	Yes	0.55	Yes	0.55	Yes	Not Applicable	NA	NA
Closure (Year 5)-Day 6636	3.20	Yes	3.70	Yes	3.70	Yes	Not Applicable	NA	NA
Closure (Year 23)-Day 13210	0.40	Yes	0.54	Yes	0.54	Yes	Not Applicable	NA	NA

**Relative Impacts from ICP-Derived Dissolved Nitrate**

green = decrease, no change, or negligible increase that is nonmeasurable (NM)

yellow = concentration increase; does not contribute to WQ standards exceedance

orange = substantial increase and/or contributes to WQ standard exceedance

(1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.

(2) Immediate Ram Mine Vicinity refers to bedrock groundwater between Sunshine and headwaters Big Flat Ck.; LAT Area refers to shallow and bedrock groundwater between LAT and Big Flat Ck.  
 Pre-BT-5 (day 1521) represents conditions prior to onset of BT-5 diversion and other related BMSG cleanup efforts in Bucktail drainage.  
 Concentrations below detection limit replaced with detection limit for calculating background (No Action concentrations).  
 Idaho Groundwater Quality Standard for Nitrate (as N) = 10 mg/L.

**Table B-1h.**  
**Predictions for Dissolved Copper Concentrations in Groundwater**  
**Idaho Cobalt FEIS**

Alternative	Project Phase <sup>(1)</sup>	Immediate Ram Mine Vicinity						Bucktail Drainage <sup>(2)</sup>						Big Flat Drainage <sup>(2)</sup>						TWSF Area			
		Copper Concentration mg/L			Groundwater Quality Standard Met?			Copper Concentration mg/L			Immediate Sunshine Mine Vicinity			Bucktail Drainage <sup>(2)</sup>			Upper Bucktail Alluvium <sup>(3)</sup>			TWSF Area			
		Best Case	Most Probable Case	Worst Case	Best Case	Most Probable Case	Worst Case	Best Case	Most Probable Case	Worst Case	Best Case	Most Probable Case	Worst Case	Best Case	Most Probable Case	Worst Case	Best Case	Most Probable Case	Worst Case	Best Case	Most Probable Case	Worst Case	
<b>Alt I - No Action</b>																							
Ram Operations	(Pre BT-5)-Day 152/1	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Ram Operations	Day 1887	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Sunshine Operations	(Day 4809	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Closure (Year 5)-Day 6636	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Closure (Year 23)-Day 132/10	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
<b>Alt II - FCC Proposal<sup>(4)</sup></b>																							
Ram Operations	(Pre BT-5)-Day 152/1	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Ram Operations	Day 1887	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Sunshine Operations	(Day 4809	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Closure (Year 5)-Day 6636	0.052	0.090	Yes	Yes	0.370	0.370	19.51	19.51	Yes	No	0.396	2.652	1.84	1.84	1.50	1.50	1.50	1.50	1.50	0.0227	0.0028	0.0028	
Closure (Year 23)-Day 132/10	0.056	0.065	Yes	Yes	0.195	0.195	0.024	0.077	0.477	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.0229	0.0030	0.0030	
<b>Alt III - Perpetual Dewatering &amp; LAT</b>																							
Ram Operations	(Pre BT-5)-Day 152/1	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Ram Operations	Day 1887	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Sunshine Operations	(Day 4809	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Closure (Year 5)-Day 6636	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Closure (Year 23)-Day 132/10	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
<b>Alt IV - Comprehensive GW Capture &amp; NPDES Big Deer Creek</b>																							
Ram Operations	(Pre BT-5)-Day 152/1	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Ram Operations	Day 1887	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Sunshine Operations	(Day 4809	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Closure (Year 5)-Day 6636	0.041	0.043	Yes	Yes	0.046	0.046	0.337	2.417	Yes	No	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.0226	0.0027	0.0027	
Closure (Year 23)-Day 132/10	0.041	0.044	Yes	Yes	0.048	0.048	0.02	0.072	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.0228	0.0028	0.0028	
<b>Alt V - Comprehensive GW Capture &amp; NPDES Blackbird Creek</b>																							
Ram Operations	(Pre BT-5)-Day 152/1	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Ram Operations	Day 1887	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Sunshine Operations	(Day 4809	0.036	0.036	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.003	0.003	0.003	
Closure (Year 5)-Day 6636	0.041	0.043	Yes	Yes	0.046	0.046	0.062	0.337	2.417	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.0226	0.0027	0.0027	
Closure (Year 23)-Day 132/10	0.041	0.044	Yes	Yes	0.048	0.048	0.02	0.072	Yes	Yes	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.0228	0.0028	0.0028	

#### Relative Impacts from ICP-Derived Dissolved Copper

green = decrease, no change, or negligible increase that is nonmeasurable (NM)  
yellow = concentration increase; does not contribute to WQ standards exceedance  
orange = substantial increase and/or contributes to WQ standard exceedance

- (1) Project phases do not apply to Alternative I - No Action and are shown for comparison purposes only.  
(2) Immediate Ram Mine Vicinity refers to bedrock groundwater between Sunshine workings and East and West Forks Bucktail Ck; Upper Bucktail Alluvium refers to BMSG Phase II capture system vicinity, TWSF Area refers to shallow and bedrock groundwater between Sunshine and headwaters Big Flat Ck.

- (3) Alt 2 Upper Bucktail Alluvium concentrations represent effects of BMSG Phase II capture system and 75% capture of Sunshine Mine load by ICP bedrock groundwater capture wells.  
Pre-BT-5 (day 152/1) represents conditions prior to onset of BT-5 diversion and other related BMSG cleanup efforts in Bucktail drainage. Decreases in Day 152/1 to 1887 concentration in Upper Bucktail Alluvium based on assumed 80% reduction from BMSG Phase I  
Phase I

Concentrations below detection limit replaced with detection limit for calculating background (No Action concentrations).  
Idaho Groundwater Quality Standard for Copper=1.30 mg/L.

**Table B-2. Percent Change in Base Flow in Streams  
FEIS Table**

Stream	Period	Alternatives				
		I	II	III	IV	V
Bucktail Creek	Ram Operations (Pre BT-5)	0 (-21)	-44 (-65)	-44 (-65)	-44 (-65)	-44 (-65)*
	Ram Operations	-100	-100	-100	-100	-100*
	Sunshine Operations	-100	-100	-100	-100	-100*
	Closure (Year 5)	-100	-100	-100	-100	-100*
	Closure (Year 23)	-100	-100	-100	-100	-100*
	Post-closure	-100	-100	-100	-100	-100*
S.F. Big Deer Creek	Ram Operations (Pre BT-5)	0 (-4)	-11 (-10)	-11 (-10)	-11 (-10)	-11 (-10)
	Ram Operations	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)*
	Sunshine Operations	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)*
	Closure (Year 5)	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)*
	Closure (Year 23)	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)*
	Post-closure	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)	-25 (-16)*
Big Deer Creek	Ram Operations (Pre BT-5)	0 (-1)	-1 (-2)	-3** (-4)	-1 (-2)	-3** (-4)
	Ram Operations	0 (-1)	-1 (-2)	-3** (-4)	-1 (-2)	-3** (-4)
	Sunshine Operations	0 (-1)	+2 (+1)	-3** (-4)	-1 (-2)	-3** (-4)
	Closure (Year 5)	0 (-1)	0 (-1)	-3** (-4)	0 (-1)	-3** (-4)
	Closure (Year 23)	0 (-1)	0 (-1)	-3** (-4)	0 (-1)	-3** (-4)
	Post-closure	0 (-1)	0 (-1)	0** (-1)	0 (-1)	0** (-1)
Panther Creek	Ram Operations (Pre BT-5)	0	0	0	0	0*
	Ram Operations	0	0	0	0	0*
	Sunshine Operations	0	0	0	0	0*
	Closure (Year 5)	0	0	0	0	0*
	Closure (Year 23)	0	0	0	0	0*
	Post-closure	0	0	0	0	0*
Big Flat Creek	Ram Operations (Pre BT-5)	0	-3	+5**	-3	-3*
	Ram Operations	0	-3	+5**	-3	-3*
	Sunshine Operations	0	-5	+5**	-4	-4*
	Closure (Year 5)	0	-3	+5**	-2	-2*
	Closure (Year 23)	0	-4	+5**	-3	-3*
	Post-closure	0	0	+5**	0	0*
Little Deer Creek	Ram Operations (Pre BT-5)	0	0	+3**	0	0
	Ram Operations	0	0	+3**	0	0
	Sunshine Operations	0	0	+3**	0	0
	Closure (Year 5)	0	0	+3**	0	0
	Closure (Year 23)	0	0	+3**	0	0
	Post-closure	0	0	+3**	0	0
Blackbird Creek	Ram Operations (Pre BT-5)	0	0	0	0	+10**
	Ram Operations	0	0	0	0	+10**
	Sunshine Operations	0	0	0	0	+10**
	Closure (Year 5)	0	0	0	0	+10**
	Closure (Year 23)	0	0	0	0	+10**
	Post-closure	0	0	0	0	0**

- Negative value denotes a reduction in flow; positive value denotes an increase in flow. All values based on DSM model predictions as described in the Water Resources Technical Report (Hydrometrics, 2006) except values in parentheses based on EPA predictions of cumulative effects of BMSG remedial actions and the ICP as described in May 24, 2007 letter from EPA (Lynne McWhorter) to SCNF (Ray Henderson).
- \*Flow change is assumed equal to change for alternative 4 DSM version 6.0
- \*\*Flow change is based on DSM version 4.0 results (Hydrometrics, 2006)

**Table B-3a.**  
**Idaho Cobalt FEIS - DSM Predicted Nitrate Concentrations in Streams**

**Most Probable or Expected Case (50th percentile)**

Alternative	Mine Stage	Ram Spring		Bucktail Creek		So Fk Big Deer		WQ-22		Big Deer Creek		WQ-24		Big Flat Creek		WQ-2		Panther Creek	
		Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	
Alt I - No action	Mine Stage	0.5 Yes	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Ram Operations (pre BT-5)	0.5 Yes	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Ram Operations	0.5 Yes	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Sunshine Operations	0.5 Yes	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Closure Year 5	0.5 Yes	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Closure Year 23	0.5 Yes	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
Alt II - FCC proposal (4)	Ram Operations (pre BT-5)	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.11 Yes	0.11 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Ram Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.11 Yes	0.11 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Sunshine Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Closure Year 5	3.2 Yes	0.9 NA	0.15 Yes	0.15 Yes	0.15 Yes	0.15 Yes	0.14 Yes	0.14 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.19 Yes	0.19 Yes	0.19 Yes	0.19 Yes		
	Closure Year 23	0.4 Yes	0.1 NA	0.15 Yes	0.15 Yes	0.08 Yes	0.08 Yes	0.06 Yes	0.06 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
Alt III - Perpetual Dewatering & LAT	Ram Operations (pre BT-5)	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Ram Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Sunshine Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Closure Year 5	0.4 Yes	0.1 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Closure Year 23	0.4 Yes	0.1 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
Alt IV - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.12 Yes	0.12 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Ram Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.11 Yes	0.11 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Sunshine Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Closure Year 5	6.8 Yes	3.6 NA	0.15 Yes	0.15 Yes	0.14 Yes	0.14 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.19 Yes	0.19 Yes	0.19 Yes	0.19 Yes		
	Closure Year 23	0.4 Yes	0.2 NA	0.15 Yes	0.15 Yes	0.08 Yes	0.08 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
Alt V - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Ram Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Sunshine Operations	No flow	0.3 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Closure Year 5	6.8 Yes	3.6 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.19 Yes	0.19 Yes	0.19 Yes	0.19 Yes		
	Closure Year 23	0.4 Yes	0.2 NA	0.15 Yes	0.15 Yes	0.07 Yes	0.07 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.2 Yes	0.18 Yes	0.18 Yes	0.18 Yes	0.18 Yes		
	Primary Drinking Water Standard	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	

Key to Color Shading:

- green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.
- yellow = DSM predicts small concentration increase that is potentially measurable.
- red = DSM predicts increase that is likely to be measurable.

Notes:

(1) "No" = observed or model predicted concentrations exceed chronic aquatic life criteria.

"Yes" = observed or model predicted concentrations are lower than chronic aquatic life criteria.

"Partial" = observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount. It is likely that streams would exceed aquatic life criteria at some times but not at others.

"No flow" = In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

(2) Concentrations shown are primarily 50th percentile values based on DSM version 6.0. In some instances DSM results have been modified based on best professional judgment to better represent expected results.

Examples of BP-J modifications include:

Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.

Estimation of Alternative V results based on analogy with Alternatives I and IV.

Estimation of Alternative 2 and 4 nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.

Estimation of Alternative 3 nitrate concentrations in Big Flat Creek based on alternative 4 DSM-predicted concentration to water treatment plant and predicted loads to land application compared to agrometric uptake.

(3) Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

(4) Concentrations represent predicted effects of Alternative II, IV and V with nitrate removal treatment to 6 mg/L (efficiencies of 70 to 90%) during mining.

**Table B-3b.**  
**Idaho Cobalt FEIS - DSM Predicted Sulfate Concentrations in Streams**  
**Most Probable or Expected Case (50th percentile)**

Alternative	Mine Stage	Ram Spring		Bucktail Creek		So Flk Big Deer		WQ-22		Big Deer Creek		WQ-24		Big Flat Creek		WQ-2		Panther Creek WQ-25	
		Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)
Alt I - No action	Ram Operations (pre BT-5)	22	Yes	23.3	NA	22.8	NA	7.3	NA	7.3	NA	7.3	NA	7.3	NA	1.6	NA	10.4	NA
	Ram Operations	22	Yes	9.3	NA	4.5	NA	4.7	NA	1.6	NA	1.6	NA	1.6	NA	1.6	NA	10.1	NA
	Sunshine Operations	22	Yes	9.3	NA	4.5	NA	4.7	NA	1.6	NA	1.6	NA	1.6	NA	1.6	NA	10.1	NA
	Closure Year 5																		
	Closure Year 23																		
Alt II - FCC proposal (4)	Ram Operations (pre BT-5)	22	Yes	9.3	NA	4.5	NA	4.7	NA	1.6	NA	1.6	NA	1.6	NA	1.6	NA	10.1	NA
	Ram Operations	No flow	No flow	9.3	NA	4.5	NA	4.6	NA	1.6	NA	1.6	NA	1.6	NA	1.6	NA	10.4	NA
	Sunshine Operations	No flow	No flow	9.3	NA	4.5	NA	4.3	NA	1.6	NA	1.6	NA	1.6	NA	1.6	NA	10.0	NA
	Closure Year 5	298	Yes	32.7	NA	4.5	NA	6.1	NA	13.7	NA	13.7	NA	13.7	NA	13.7	NA	10.3	NA
	Closure Year 23	51	Yes	9.3	NA	4.5	NA	5.2	NA	9.9	NA	9.9	NA	9.9	NA	9.9	NA	10.2	NA
Alt III - Perpetual Dewatering & LAT	Ram Operations (pre BT-5)	No flow	No flow	23.3	NA	22.8	NA	7.3	NA	186	NA	186	NA	186	NA	186	NA	10.4	NA
	Ram Operations	No flow	No flow	9.3	NA	4.5	NA	4.7	NA	155	NA	155	NA	155	NA	155	NA	10.1	NA
	Sunshine Operations	No flow	No flow	9.3	NA	4.5	NA	4.7	NA	50	NA	50	NA	50	NA	50	NA	10.1	NA
	Closure Year 5																		
	Closure Year 23																		
Alt IV - Comprehensive GW Capture & NPDES Big Deer Creek	Ram Operations (pre BT-5)	No flow	No flow	23.3	NA	22.3	NA	7.3	NA	10.6	NA	10.6	NA	10.6	NA	10.6	NA	10.4	NA
	Ram Operations	No flow	No flow	9.3	NA	4.5	NA	4.7	NA	10.6	NA	10.6	NA	10.6	NA	10.6	NA	10.4	NA
	Sunshine Operations	No flow	No flow	9.3	NA	4.5	NA	4.7	NA	50	NA	50	NA	50	NA	50	NA	10.1	NA
	Closure Year 5	298	No	32.7	NA	4.5	NA	4.7	NA	50	NA	50	NA	50	NA	50	NA	10.1	NA
	Closure Year 23	51	Yes	9.3	NA	4.5	NA	4.7	NA	50	NA	50	NA	50	NA	50	NA	10.1	NA
Alt V - Comprehensive GW Capture & NPDES Blackbird Creek	Ram Operations (pre BT-5)	No flow	No flow	23.3	NA	22.3	NA	7.3	NA	10.6	NA	10.6	NA	10.6	NA	10.6	NA	10.4	NA
	Ram Operations	No flow	No flow	9.3	NA	4.5	NA	4.7	NA	10.6	NA	10.6	NA	10.6	NA	10.6	NA	10.4	NA
	Sunshine Operations	No flow	No flow	9.3	NA	4.5	NA	4.7	NA	10.6	NA	10.6	NA	10.6	NA	10.6	NA	10.4	NA
	Closure Year 5	298	No	32.7	NA	4.5	NA	4.7	NA	10.6	NA	10.6	NA	10.6	NA	10.6	NA	10.4	NA
	Closure Year 23	51	Yes	9.3	NA	4.5	NA	4.7	NA	10.6	NA	10.6	NA	10.6	NA	10.6	NA	10.4	NA
Water Quality Standard - Aquatic Life Criterion	None (5)			None (5)															

Key to Color Shading:

green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.

yellow = DSM predicts small concentration increase that is potentially measurable.

red = DSM predicts increase that is likely to be measurable.

Notes:

(1) "No" = observed or model predicted concentrations exceed chronic aquatic life criteria.

"Yes" = observed or model predicted concentrations are lower than chronic aquatic life criteria.

"Partial" = observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount.

"No flow" = In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

- (2) Concentrations shown are primarily 50th percentile values based on DSM version 6.0. In some instances DSM results have been modified based on best professional judgment to better represent expected results.  
 Examples of BPJ modifications include:  
 Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.  
 Estimation of Alternative V results based on analogy with Alternatives I and IV.  
 Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.  
 Estimation of Alternative III results based on DSM version 4 results (Hydrometrics, 2005) and analogy with DSM version 6 results for alternatives I and IV.

- (3) Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. This is not predicted to occur as the Alternative IV capture system is predicted to have a higher potential efficiency than Alternative II. For Alternatives II and IV, simulations assume water treatment effluent of <50 mg/L and <400 mg/L, respectively.

- (4) Concentrations represent predicted effects of Alternative II, IV, and V with post-mining groundwater capture and treatment. For modeling calculation purposes, the chemical mass load removal requirement of Alternative IV capture and treatment system was based on the calculated chemical mass load production from the previous model month. This calculation approach results in a slight calculated increase in concentration in cases where the previous months load is less than the current value. This slight increase can be mitigated by the use of a margin of safety in load removal requirements. This calculation approach may also result in an apparent lower groundwater capture efficiency (and higher surface water concentrations) for Alternative IV in comparison to Alternative II.

- (5) For comparison, the Federal Secondary Drinking Water Standard is 250 mg/L.

**Table B-3c.**  
**Idaho Cobalt FEIS - DSM Predicted Zinc Concentrations in Streams**  
**Most Probable or Expected Case (50th percentile)**

		Ram Spring		Bucktail Creek		So Fk Big Deer WQ-22		Big Deer Creek WQ-24		Big Flat Creek WQ-2		Panther Creek WQ-25	
Alternative	Mine Stage	Water Quality Standard Concentration (mg/L) (2)	Met? (1)	Water Quality Standard Concentration (mg/L) (1)	Met? (3)	Water Quality Standard Concentration (mg/L) (2)	Met? (1)	Water Quality Standard Concentration (mg/L) (2)	Met? (1)	Water Quality Standard Concentration (mg/L) (2)	Met? (1)	Water Quality Standard Concentration (mg/L) (2)	Met? (1)
Alt I - No action	Ram Operations (pre BT-5)	0.005 Yes	0.003 Yes	NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Rain Operations	0.005 Yes	0.001 Yes	NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Sunshine Operations			0.001 Yes	NA	0.002 Yes	Yes						
	Closure Year 5	0.005 Yes	0.001 Yes	NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 23	0.005 No	0.001 No	NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
Alt II - FCC proposal (4)	Ram Operations (pre BT-5)	No flow No flow	No flow No flow	0.003 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Rain Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Sunshine Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 5	0.049 No	0.045 No	NA	0.001 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 23	0.045 No	0.045 No	NA	0.001 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
Alt III - Perpetual Dewatering & LAT	Ram Operations (pre BT-5)	No flow No flow	No flow No flow	0.003 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Rain Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Sunshine Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 5	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 23	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
Alt IV - Comprehensive GW Capture & NPDES Big Deer Creek	Ram Operations (pre BT-5)	No flow No flow	No flow No flow	0.003 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Rain Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Sunshine Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 5	0.040 Partial	0.040 Partial	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 23	0.040 Partial	0.040 Partial	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
Alt V - Comprehensive GW Capture & NPDES Blackbird Creek	Ram Operations (pre BT-5)	No flow No flow	No flow No flow	0.003 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Rain Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Sunshine Operations	No flow No flow	No flow No flow	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 5	0.040 Partial	0.040 Partial	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
	Closure Year 23	0.040 Partial	0.040 Partial	0.001 NA	0.002 Yes	Yes	0.002 Yes	Yes	0.003 Yes	Yes	0.002 Yes	Yes	0.002 Yes
Water Quality Standard - Aquatic Life Criterion		0.0365		0.0365		0.0365		0.0365		0.0365		0.0365	
	Hardness	25		25		25		25		25		25	

Key to Color Shading:  
 green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.  
 yellow = DSM predicts small concentration increase that is potentially measurable.

red = DSM predicts increase that is likely to be measurable.  
 Examples of BP-J modifications include:  
 Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.

Notes:  
 (1) "No" = observed or model predicted concentrations exceed chronic aquatic life criteria.  
 "Yes" = observed or model predicted concentrations are lower than chronic aquatic life criteria.  
 "Partial" = observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount. It is likely that streams would exceed aquatic life criteria at some times but not at others.  
 "No flow" = In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

(2) Concentrations shown are primarily 50th percentile values based on DSM version 6.0. In some instances DSM results have been modified based on best professional judgment to better represent expected results.  
 Examples of BP-J modifications include:  
 Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.  
 Estimation of Alternative V results based on analogy with Alternatives I and IV.  
 Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.  
 Estimation of Alternative III results based on DSM version 4 results (Hydrometrics, 2005) and analogy with DSM version 6 results for alternatives I and IV.

(3) Bucktail Creek concentrations historically and currently exceeded aquatic life criteria due to Blackbird Mine contamination. However, Bucktail Creek has a Use Attainability Analysis (IDFQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

(4) Concentrations represent predicted effects of Alternative II, IV, and V with post-mining groundwater capture and treatment. For modeling calculation purposes, the chemical mass load removal requirement of Alternative IV capture and treatment system was based on the calculated chemical mass load produced from the previous month's load is less than the current value. This slight increase can be mitigated by the use of a margin of safety in load removal requirements. This calculation approach may also result in an apparent lower groundwater capture efficiency (and higher surface water concentrations) for Alternative IV in comparison to Alternative II. This is not predicted to occur as the Alternative IV capture system is predicted to have a higher potential efficiency than Alternative II.

**Table B-3d.**  
**Idaho Cobalt FEIS - DSM Predicted Cobalt Concentrations in Streams**  
**Most Probable or Expected Case (50th percentile)**

Alternative	Mine Stage	Ram Spring		Bucktail Creek		So Fk Big Deer WQ-22		Big Deer Creek WQ-24		Big Flat Creek WQ-2		Panther Creek WQ-25		
		Cleanup Concentration (mg/L) (2)	Value Met? (1)	Cleanup Concentration (mg/L) (2)	Value Met? (1) (3)	Cleanup Concentration (mg/L) (2)	Value Met? (1)	Cleanup Concentration (mg/L) (2)	Value Met? (1)	Cleanup Concentration (mg/L) (2)	Value Met? (1)	Cleanup Concentration (mg/L) (2)	Value Met? (1)	
Alt I - No action	Ram Operations (pre BT-5)	0.02	Yes	0.13	NA	0.093	No	0.017	Yes	0.021	Yes	0.019	Yes	
	Ram Operations	0.02	Yes	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	
	Sunshine Operations	0.02	Yes	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	
	Closure Year 5	0.02	Yes	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	
	Closure Year 23	0.02	Yes	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	
Alt II - FCCC Proposal (4)	Ram Operations (pre BT-5)	No flow	0.13	NA	0.098	No	0.016	Yes	0.021	Yes	0.018	Yes	0.018	Yes
	Ram Operations	No flow	0.06	NA	0.003	Yes	0.004	Yes	0.021	Yes	0.017	Yes	0.017	Yes
	Sunshine Operations	No flow	0.05	NA	0.003	Yes	0.004	Yes	0.022	Yes	0.017	Yes	0.017	Yes
	Closure Year 5	No	0.136	NA	0.17	NA	0.003	Yes	0.004	Yes	0.021	Yes	0.017	Yes
	Closure Year 23	No	0.081	NA	0.04	NA	0.003	Yes	0.003	Yes	0.022	Yes	0.017	Yes
Alt III - Perpetual Dewatering & LAT	Ram Operations	No flow	0.13	NA	0.100	No	0.017	Yes	0.021	Yes	0.019	Yes	0.019	Yes
	Sunshine Operations	No flow	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	0.017	Yes
	Closure Year 5	No flow	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	0.017	Yes
	Closure Year 23	No flow	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	0.017	Yes
Alt IV - Comprehensive GW Capture & NPDES Big Ram Operations	Ram Operations (pre BT-5)	No flow	0.13	NA	0.100	No	0.017	Yes	0.021	Yes	0.018	Yes	0.018	Yes
	Sunshine Operations	No flow	0.06	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	0.017	Yes
	Closure Year 5	No	0.042	Yes	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes
	Closure Year 23	No	0.042	Yes	0.05	NA	0.003	Yes	0.004	Yes	0.021	Yes	0.017	Yes
Alt V - Comprehensive GW Capture & NPDES Blackbird Creek	Ram Operations (pre BT-5)	No flow	0.13	NA	0.100	No	0.017	Yes	0.021	Yes	0.018	Yes	0.018	Yes
	Ram Operations	No flow	0.06	NA	0.003	Yes	0.005	Yes	0.022	Yes	0.017	Yes	0.017	Yes
	Sunshine Operations	No flow	0.05	NA	0.003	Yes	0.005	Yes	0.021	Yes	0.017	Yes	0.017	Yes
	Closure Year 5	No	0.042	Yes	0.05	NA	0.003	Yes	0.004	Yes	0.021	Yes	0.017	Yes
	Closure Year 23	No	0.042	Yes	0.05	NA	0.003	Yes	0.004	Yes	0.021	Yes	0.017	Yes
Site-specific Blackbird cleanup value		0.086		0.086		0.086		0.086		0.086		0.086		0.086
	Hardness		25		25			25		25		25		25

Key to Color Shading:  
green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.  
yellow = DSM predicts small concentration increase that is potentially measurable.  
red = DSM predicts increase that is likely to be measurable.

## Notes:

- "No" = observed or model predicted concentrations exceed chronic aquatic life criteria.
- "Yes" = observed or model predicted concentrations are lower than cleanup value.
- "Partial" = observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount. It is likely that streams would exceed aquatic life criteria at some times but not at others.
- "No flow" = In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

- Concentrations shown are primarily 50th percentile values based on DSM version 6.0. In some instances DSM results have been modified based on best professional judgment to better represent expected results. Examples of BMP modifications include:  
Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.  
Estimation of Alternative V results based on analogy with Alternatives I and IV.  
Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline. Estimation of Alternative III results based on DSM version 4 results (Hydrometrics, 2005) and analogy with DSM version 6 results for alternatives I and IV.

- Bucktail Creek concentrations historically and currently exceed aquatic life criteria due to Blackbird Mine contamination. However, Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

- Concentrations represent predicted effects of Alternative II, IV, and V with post-mining groundwater capture and treatment. For modeling calculation purposes, the chemical mass load removal requirement of Alternative IV capture was based on the calculated chemical mass load production from the previous model month. This calculation approach results in a slight calculated increase in concentration in cases where the previous months load is less than the current increase can be mitigated by the use of a margin of safety in load removal requirements. This calculation approach may also result in an apparent lower groundwater capture efficiency (and higher surface water concentrations) for Alternative II. This is not predicted to occur as the Alternative IV capture system is predicted to have a higher potential efficiency than Alternative II.

**Table B-3e.**  
**Idaho Cobalt FEIS - DSM Predicted Nickel Concentrations in Streams**

		Most Probable or Expected Case (50th percentile)		Ram Spring		Bucktail Creek		So Fork Big Deer WQ-22		Big Deer Creek WQ-24		Big Flat Creek WQ-2		Panther Creek WQ-25	
Alternative	Mine Stage	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)
Alt I - No action	Ram Operations (pre BT-5)	0.002 Yes	NA	0.002 Yes	NA	0.001 Yes	NA	0.002 Yes	NA	0.001 Yes	NA	0.001 Yes	NA	0.001 Yes	NA
	Ram Operations	0.002 Yes	Yes	0.001 NA	Yes	0.001 Yes	Yes	0.002 Yes	Yes	0.001 Yes	Yes	0.001 Yes	Yes	0.001 Yes	Yes
	Sunshine Operations	0.002 Yes	Yes	0.001 NA	Yes	0.001 Yes	Yes								
	Closure Year 5	0.002 Yes	Yes	0.001 NA	Yes	0.001 Yes	Yes								
	Closure Year 23	0.002 Yes	Yes	0.001 NA	Yes	0.001 Yes	Yes								
Alt II - FCC proposal (4)	Ram Operations (pre BT-5)	No flow 0.002	No flow	No flow 0.002	NA	No flow 0.002	Yes								
	Ram Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Sunshine Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Closure Year 5	0.008 Yes	Yes	0.004 NA	Yes										
	Closure Year 23	0.005 Yes	Yes	0.001 NA	Yes	0.001 Yes	Yes								
Alt III - Perpetual Dewatering & LAT	Ram Operations (pre BT-5)	No flow 0.002	No flow	No flow 0.002	NA	No flow 0.002	Yes								
	Ram Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Sunshine Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Closure Year 5	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Closure Year 23	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
Alt IV - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow 0.002	No flow	No flow 0.002	NA	No flow 0.002	Yes								
	Ram Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Sunshine Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Closure Year 5	0.002 Yes	Yes	0.003 NA	Yes										
	Closure Year 23	0.002 Yes	Yes	0.001 NA	Yes										
Alt V - Comprehensive GW Capture & NPDES Blackbird Creek	Ram Operations (pre BT-5)	No flow 0.002	No flow	No flow 0.002	NA	No flow 0.002	Yes								
	Ram Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Sunshine Operations	No flow Yes	No flow	No flow Yes	NA	No flow Yes	Yes								
	Closure Year 5	0.002 Yes	Yes	0.003 NA	Yes										
	Closure Year 23	0.002 Yes	Yes	0.001 NA	Yes										
Water Quality Standard - Aquatic Life Criterion Hardness		0.016		0.016		0.016		0.016		0.016		0.016		0.016	
		25		25		25		25		25		25		25	

Key to Color Shading:

green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.

yellow = DSM predicts small concentration increase that is potentially measurable.

red = DSM predicts increase that is likely to be measurable.

Notes:

(1) "No" = observed or model predicted concentrations exceed chronic aquatic life criteria.

"Yes" = observed or model predicted concentrations are lower than chronic aquatic life criteria.

"Partial" = observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount. It is likely that streams would exceed aquatic life criteria at some times but not at others.

"No flow" = In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

(2) Concentrations shown are primarily 50th percentile values based on DSM version 6. In some instances DSM results have been modified based on best professional judgment to better represent expected results.

Examples of BMP modifications include:

Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.

Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.

Estimation of Alternative V results based on DSM version 4 results (Hydrometrics, 2005) and analogy with DSM version 6 results for alternatives I and IV.

(3) Bucktail Creek concentrations historically and currently exceed aquatic life criteria due to Blackbird Mine contamination. However, Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations or the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

(4) Concentrations represent predicted effects of Alternative II, IV, and V with post-mining groundwater capture and treatment. For modeling calculation purposes, the chemical mass load removal requirement of Alternative IV capture and treatment system was based on the calculated chemical mass load production from the previous model month. This calculation approach results in a slight calculated increase in concentration in cases where the previous months load is less than the current value. This slight increase can be mitigated by the use of a margin of safety in load removal requirements. This calculation approach may also result in an apparent lower groundwater capture efficiency (and higher surface water concentrations) for Alternative IV in comparison to Alternative II. This is not predicted to occur as the Alternative IV capture system is predicted to have a higher potential efficiency than Alternative II.

**Table B-3f.**  
**Idaho Cobalt FEIS - DSM Predicted Arsenic Concentrations in Streams**  
**Most Probable or Expected Case (50th percentile)**

Alternative	Mine Stage	Ram Spring Concentration (mg/L) (5)	Bucktail Creek Water Quality Standard Met? (1)	So Fk Big Deer WQ-22 Concentration (mg/L) (2)	Big Deer Creek WQ-24 Water Quality Standard Met? (1)	Big Flat Creek WQ-2 Water Quality Standard Met? (1)	Panther Creek WQ-25 Water Quality Standard Met? (1)
Alt I - No action	Ram Operations (pre BT-5)	0.037 Yes	NA	0.0001 Yes	0.0006 Yes	0.0002 Yes	0.001 Yes
	Ram Operations	0.037 Yes	NA	0.0003 NA	0.0001 Yes	0.0002 Yes	0.001 Yes
	Sunshine Operations	0.037 Yes	NA	0.0003 NA	0.0001 Yes	0.0002 Yes	0.001 Yes
	Closure Year 23	0.037 Yes	NA	0.0003 NA	0.0001 Yes	0.0002 Yes	0.001 Yes
Alt II - FCC proposal (4)	Ram Operations (pre BT-5)	No flow	0.0009 NA	0.0001 Yes	0.0005 Yes	0.0002 Yes	0.001 Yes
	Ram Operations	No flow	0.0009 NA	0.0001 Yes	0.0010 Yes	0.0002 Yes	0.001 Yes
	Sunshine Operations	No flow	0.0003 NA	0.0001 Yes	0.0010 Yes	0.0002 Yes	0.001 Yes
	Closure Year 5	0.103 Yes (5)	0.0003 NA	0.0001 Yes	0.0010 Yes	0.0002 Yes	0.001 Yes
	Closure Year 23	0.118 Yes (5)	0.0003 NA	0.0001 Yes	0.0010 Yes	0.0002 Yes	0.001 Yes
Alt III - Perpetual Dewatering & LAT	Ram Operations (pre BT-5)	No flow	0.0008 NA	0.0001 Yes	0.0005 Yes	0.0002 Yes	0.001 Yes
	Ram Operations	No flow	0.0003 NA	0.0001 Yes	0.0005 Yes	0.0002 Yes	0.001 Yes
	Sunshine Operations	No flow	0.0003 NA	0.0001 Yes	0.0005 Yes	0.0002 Yes	0.001 Yes
	Closure Year 5	No flow	0.0003 NA	0.0001 Yes	0.0005 Yes	0.0002 Yes	0.001 Yes
	Closure Year 23	No flow	0.0008 NA	0.0001 Yes	0.0009 Yes	0.0002 Yes	0.001 Yes
Alt IV - Comprehensive GW Capture & NPDES Big Deer Creek	Ram Operations (pre BT-5)	No flow	0.0003 NA	0.0001 Yes	0.0005 Yes	0.0002 Yes	0.001 Yes
	Sunshine Operations	No flow	0.0003 NA	0.0001 Yes	0.0005 Yes	0.0002 Yes	0.001 Yes
	Closure Year 5	0.107 Yes (5)	0.060 NA	0.0001 Yes	0.0022 Yes	0.0002 Yes	0.001 Yes
	Closure Year 23	0.122 Yes (5)	0.050 NA	0.0001 Yes	0.0025 Yes	0.0002 Yes	0.001 Yes
Alt V - Comprehensive GW Capture & NPDES Blackbird Creek	Ram Operations (pre BT-5)	No flow	0.0008 NA	0.0001 Yes	0.0009 Yes	0.0002 Yes	0.001 Yes
	Sunshine Operations	No flow	0.0003 NA	0.0001 Yes	0.0008 Yes	0.0002 Yes	0.001 Yes
	Closure Year 5	No flow	0.0003 NA	0.0001 Yes	0.0003 Yes	0.0002 Yes	0.001 Yes
	Closure Year 23	0.107 Yes (5)	0.050 NA	0.0001 Yes	0.0022 Yes	0.0002 Yes	0.001 Yes
Water Quality Standard - Aquatic Life Criterion		0.15	0.15	0.15	0.15	0.15	0.15
Federal Primary Drinking Water Standard		0.01	0.01	0.01	0.01	0.01	0.01
Idaho Human Health Standard		0.05	0.05	0.05	0.05	0.05	0.05

Key to Color Shading:

green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.

yellow = DSM predicts small concentration increase that is potentially measurable.

red = DSM predicts increase that is likely to be measurable.

## Notes:

(1) "No" = Observed or model predicted concentrations exceed chronic aquatic life criteria.

"Yes" = Observed or model predicted concentrations are lower than chronic aquatic life criteria.

"Partial" = Observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount. It is likely that streams would exceed aquatic life criteria at some times but not at others.

"No flow" = In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

(2) Concentrations shown are primarily 50th percentile values based on DSM results (DSM version 6.0). In some instances DSM results have been modified based on best professional judgment to better represent expected results.

Examples of BMP modifications include:

Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.

Estimation of Alternative V results based on analogy with Alternatives I and IV

Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.

(3) Bucktail Creek concentrations historically and currently exceed aquatic life criteria due to Blackbird Mine contamination. However, Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

(4) Concentrations represent predicted effects of Alternative II, IV, and V with post-mining groundwater capture and treatment. For modeling calculation purposes, the chemical mass load removal requirement of Alternative IV capture and treatment

applies to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in a slight calculated increase in concentration in cases where the previous months load is less than the current value. This slight increase can be mitigated by the use of a margin of safety in load removal requirements. This calculation approach may also result in an apparent lower groundwater capture efficiency (and higher surface water concentrations) for Alternative IV in comparison to Alternative II. This is not predicted to occur as the Alternative IV capture system is predicted to have a higher potential efficiency than Alternative II.

(5) The DSM does not simulate geochemical reactions that are expected to attenuate arsenic in the groundwater system. Natural attenuation of arsenic is expected to result in arsenic concentrations at Ram Spring and Bucktail Creek that are similar to existing conditions as shown in the no action alternative and that meet water quality standards.

**Table B-3g.**  
**Idaho Cobalt FEIS - DSM Predicted Copper Concentrations in Streams**  
**90th percentile Case (90% probability that actual value will be lower than value shown).**

		Ram Spring			Bucktail Creek			So Fork Big Deer WQ-22			Big Deer Creek WQ-24			Big Flat Creek WQ-2			Panther Creek WQ-25		
Alternative	Mine Stage	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)		
Alt I - No action	Ram Operations (pre BT-5)	0.026	No	0.08	NA	0.065	No	0.012	No	0.002	Yes	0.004	Partial	0.004	Partial	0.004	Partial		
	Ram Operations	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Sunshine Operations	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 5	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 23	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
Alt II - FCCC proposal (4)	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.011	No	0.002	Yes	0.004	Partial	0.004	Partial	0.004	Partial		
	Ram Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 5	0.370	No	0.64	NA	0.002	Yes	0.008	No	0.002	Yes	0.004	Partial	0.004	Partial	0.004	Partial		
	Closure Year 23	0.195	No	0.05	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
Alt III - Perpetual Dewatering & LAT	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	0.004	Partial	0.004	Partial		
	Ram Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 5	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 23	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
Alt IV - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.011	No	0.002	Yes	0.004	Partial	0.004	Partial	0.004	Partial		
	Ram Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 5	0.046	No	0.046	NA	0.002	Yes	0.004	Yes (4)	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 23	0.048	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
Alt V - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	0.004	Partial	0.004	Partial		
	Ram Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 5	0.046	No	0.046	NA	0.002	Yes	0.004	Yes (4)	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 23	0.048	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
Blackbird Creek	Ram Operations	No flow	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	0.004	Partial	0.004	Partial		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 5	0.046	No	0.14	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
	Closure Year 23	0.048	No	0.04	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.003	Yes	0.003	Yes		
Water Quality Standard - Aquatic Life Criterion Hardness	25			0.0035		0.0035		0.0035		0.0035		0.0035		0.0035		0.0035			

Key to Color Shading:  
 green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.  
 yellow = DSM predicts small concentration increase that is potentially measurable.  
 red = DSM predicts increase that is likely to be measurable.

Notes:

(1) "No" = observed or model predicted concentrations exceed chronic aquatic life criteria.

"Yes" = observed or model predicted concentrations are lower than chronic aquatic life criteria.

"Partial" = observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount. It is likely that streams would exceed aquatic life criteria at some times but not at others.

In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

(2) Concentrations shown are primarily 50th percentile values based on DSM version 6.0. In some instances DSM results have been modified based on best professional judgment to better represent expected results.

Examples of BPJ modifications include:

Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.

Estimation of Alternative V results based on analogy with Alternatives I and IV.

Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.

Estimation of Alternative III results based on DSM version 4 results (Hydrometrics, 2005) and analogy with DSM version 6 results for alternatives I and IV.

(3) Bucktail Creek concentrations historically and currently exceed aquatic life criteria due to Blackbird Mine contamination. However, Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

(4) For modeling calculation purposes, the chemical mass load removal requirement of Alternative IV capture and treatment system was based on the calculated chemical mass load production from the previous model month. This calculation approach results in a slight calculated increase in copper concentration in cases where the previous months copper load is less than the current value. This slight increase can be mitigated by the use of a margin of safety in load removal requirements. This calculation approach may also result in an apparent lower groundwater capture efficiency (and higher surface water concentrations) for Alternative IV in comparison to Alternative II. This not predicted to occur as the Alternative IV capture system is predicted to have a higher potential efficiency than Alternative II.

**Table B-3h.**  
**Idaho Cobalt FEIS - DSM Predicted Copper Concentrations in Streams**  
**10th percentile Case (90% probability that actual value will be higher than shown)**

Alternative	Mine Stage	Ram Spring			Bucktail Creek			So Fk Big Deer WQ-22			Big Deer Creek WQ-24			Big Flat Creek WQ-2			Panther Creek WQ-25		
		Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)	Concentration (mg/L) (2)	Water Quality Standard Met? (1)		
Alt I - No action	Ram Operations (pre BT-5)	0.026	No	0.08	NA	0.065	No	0.012	No	0.002	Yes	0.003	Yes	0.002	Yes	0.004	Partial		
	Ram Operations	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Sunshine Operations	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 5	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 23	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
Alt II - FCCC proposal (4)	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.011	No	0.002	Yes	0.004	Partial	0.002	Yes	0.003	Yes		
	Ram Operations	No flow	No flow	0.02	NA	0.002	Yes	0.003	Yes										
	Sunshine Operations	No flow	No flow	0.02	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 5	0.052	No	0.03	NA	0.002	Yes	0.003	Yes										
	Closure Year 23	0.050	No	0.03	NA	0.002	Yes	0.003	Yes										
Alt III - Perpetual Dewatering & LAT	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	0.002	Yes	0.003	Yes		
	Ram Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 5	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 23	No flow	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
Alt IV - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.011	No	0.002	Yes	0.004	Partial	0.002	Yes	0.003	Yes		
	Ram Operations	No flow	No flow	0.02	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.02	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 5	0.041	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 23	0.041	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
Alt V - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	0.002	Yes	0.003	Yes		
	Ram Operations	No flow	No flow	0.03	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 5	0.041	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 23	0.041	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
Alt VI - Comprehensive GW Capture & NPDES	Ram Operations (pre BT-5)	No flow	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	0.002	Yes	0.003	Yes		
	Ram Operations	No flow	No flow	0.03	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Sunshine Operations	No flow	No flow	0.03	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 5	0.041	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
	Closure Year 23	0.041	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes		
Water Quality Standard Aquatic Life Criterion Hardness	0.0035		0.0035		0.0035		0.0035		0.0035		0.0035		0.0035		0.0035		0.0035		
		25		25		25		25		25		25		25		25			

Key to Color Shading:  
 green = DSM predicts decrease or very small increase in concentration that is calculable but not measurable.  
 yellow = DSM predicts small concentration increase that is potentially measurable.  
 red = DSM predicts increase that is likely to be measurable.

## Notes:

(1) "No" = observed or model predicted concentrations exceed chronic aquatic life criteria.

(2) "Yes" = observed or model predicted concentrations are lower than chronic aquatic life criteria.

(3) "Partial" = observed or model predicted concentrations exceed chronic aquatic life criteria by a small amount.

It is likely that streams would exceed aquatic life criteria at some times but not at others.

In alternative III, Ram Spring would be substantially dewatered except possibly during the spring snowmelt period.

(2) Concentrations shown are primarily 50th percentile values based on DSM version 6.0. In some instances DSM results have been modified based on best professional judgment to better represent expected results.

Examples of BPJ modifications include:

Substitution of baseline or no-action predicted concentrations where DSM results are less than zero.

Estimation of Alternative V results based on analogy with Alternatives I and IV.

Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.

Estimation of Alternative III results based on DSM version 4 results (Hydrometrics, 2005) and analogy with DSM version 6 results for alternatives I and IV.

(3) Bucktail Creek concentrations historically and currently exceed aquatic life criteria due to Blackbird Mine contamination. However, Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no-action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

(4) For modelling calculation purposes, the chemical mass load removal requirement of Alternative IV capture and treatment system was based on the calculated chemical mass load production from the previous model month. This calculation approach results in a slight calculated increase in copper concentration in cases where the previous months copper load is less than the current value. This slight increase can be mitigated by the use of a margin of safety in load removal requirements. This calculation approach may also result in an apparent lower groundwater capture efficiency (and higher surface water concentrations) for Alternative IV in comparison to Alternative II. This is not predicted to occur as the Alternative IV capture system is predicted to have a higher potential efficiency than Alternative II.

**Table B-3i.**  
**Idaho Cobalt FEIS - DSM Predicted Copper Concentrations in Streams**

**Most Probable or Expected Case (50th percentile, 50% probability that actual value will be higher than value shown)**

		Ram Spring		Bucktail Creek (3)		So Fk Big Deer WQ22		Big Deer Creek WQ24		Big Flat Creek WQ2		Panther Creek WQ-25	
		Water Quality Standard	Concentration (mg/L) (2)	Water Quality Standard	Concentration (mg/L) (2)	Met? (1)	Water Quality Standard	Concentration (mg/L) (2)	Met? (1)	Water Quality Standard	Concentration (mg/L) (2)	Met? (1)	Water Quality Standard
Alternative	Mine Stage	0.026	No	0.03	NA	0.065	No	0.012	No	0.002	Yes	0.004	Partial
Alt I - No action	Ram Operations [pre BT-5]	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
	Ram Operations	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
	Sunshine Operations	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
	Closure Year 23	0.026	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
Alt II - FCC proposal with post-closure groundwater capture and treatment mitigation	Ram Operations [pre BT-5]	No flow	0.08	NA	0.068	No	0.011	No	0.002	Yes	0.004	Partial	
	Ram Operations	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	Sunshine Operations	No flow	0.03	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes	
	Closure Year 5	0.090	No	0.07	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
	Closure Year 23	0.065	No	0.01	NA	0.002	Yes	0.002	Yes	0.002	Yes	0.003	Yes
Alt III - Perpetual Dewatering & LAT	Ram Operations [pre BT-5]	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	
	Ram Operations	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	Sunshine Operations	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	Closure Year 5	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	Closure Year 23	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
Alt IV - Comprehensive GW Capture & NPDES	Ram Operations [pre BT-5]	No flow	0.08	NA	0.068	No	0.011	No	0.002	Yes	0.004	Partial	
	Ram Operations	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	Sunshine Operations	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	Closure Year 5	0.043	No	0.05	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
	Closure Year 23	0.044	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
Alt V - Comprehensive GW Capture & NPDES	Ram Operations [pre BT-5]	No flow	0.08	NA	0.068	No	0.012	No	0.002	Yes	0.004	Partial	
	Ram Operations	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	BIG Deer Creek	No flow	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes	
	Closure Year 5	0.043	No	0.05	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
	Closure Year 23	0.044	No	0.03	NA	0.002	Yes	0.003	Yes	0.002	Yes	0.003	Yes
Alt VI - Aquatic Life Criterion	Water Quality Standard - Aquatic Life Criterion	0.0035		0.0035		0.0035		0.0035		0.0035		0.0035	
	Hardness	25		25		25		25		25		25	

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Estimation of Alternative V results based on analogy with Alternatives I and IV.

Estimation of nitrate concentrations by addition of DSM-predicted concentration change to ambient baseline.

Estimation of Alternative III results based on DSM version 4 results (Hydrometrics, 2005) and analogy with DSM version 6 results for alternatives I and IV.

(3) Bucktail Creek concentrations historically and currently exceed aquatic life criteria due to Blackbird Mine contamination. However, Bucktail Creek has a Use Attainability Analysis (IDEQ, 2002) so water quality standards do not currently apply to the creek. Concentrations calculated by the DSM for Bucktail Creek should be used with caution because the concentrations and chemical mass loads in Bucktail Creek were adjusted in the DSM as needed to adjust (calibrate) concentrations in South Fork Big Deer Creek and Big Deer Creek to current and future concentrations for the no action alternative. In some cases, calibration of the model combined with the load removed by groundwater pumping and treatment results in negative loads and concentrations in Bucktail Creek. In those cases, values presented in the table reflect the no-action alternative.

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